

Compaq StorageWorks

Release Notes

HSG80 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.6B for Windows NT and Windows 2000

These Release Notes contain last-minute and supplemental information about the HSG80 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.6B for Windows NT and Windows 2000.

Be sure to read these Release Notes before installing your Enterprise/Modular Storage RAID Array. In the event of conflicting information between these Release Notes and other documents contained in this product release, the Release Note content takes precedence. Product documentation is periodically updated and available on the Compaq website:

<http://www.compaq.com/storage/index.html>

Seventh Edition (February 2002)
Part Number: AA-RHOQG-TE
Compaq Computer Corporation

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Document Catalog

To view and access product documentation included with your StorageWorks Solution Software CD-ROM, open the `manuals.pdf` file, found on your CD-ROM. This file serves as a catalog and provides links to all manuals and documents included on your CD-ROM. Multiple document search functionality is also provided through the use of this catalog file.

NOTE: All provided documents are included in the `document` folder of your CD-ROM, should you choose to access them directly.

Release Notes (such as the document you are now reading) are not included on the CD-ROM. This is by design and allows for last minute changes that become available after documents go to press.

IMPORTANT: Please see the "Documentation Anomalies" Section, page 48, of these Release Notes for any last minute corrections or additions to the provided documentation set.

To view Portable Document Format (PDF) files, you need Adobe Acrobat Reader Version 4.05 or higher. If you do not have this program installed, you can install it from the `acrobat` folder on your CD-ROM. See the `readme.txt` file in the `acrobat` folder for more information.

To take best advantage of the multiple document search functionality, Compaq recommends that you install the Windows-based Acrobat Reader and launch it as a separate application, rather than through a browser.

NOTE: If you choose to access the `manuals.pdf` catalog file through a browser, an up-to-date Acrobat Reader plug-in is required if you wish to use search functionality. However, instances may occur where search results will not display when run from within your browser.

NOTE: Occasionally, you may have problems with mounting the catalog index when using Acrobat Readers. In order to take full advantage of the multiple document search functionality, you may need to manually mount the search index on a per session basis. The following steps outline this procedure:

1. After launching the Acrobat Reader, load the `manuals.pdf` catalog file.
2. If you see the error message, "The index associated with this document <index> is not available," click **OK** to clear the message and proceed to the next step.

If this error message does not appear, your index has been mounted correctly and this procedure does not apply.

3. From the Edit Menu, select Search > Select Indexes.
4. From the Index Selection dialogue, click the Add button.
5. Enter the path to the `index.pdx` file.

For Windows-based readers, this is typically:

```
\acrobat\index.pdx
```

6. Click **OK** to accept this selection.
7. Making sure the newly added index is selected in the Index Selection dialogue, click **OK** to exit. The catalog search function will now operate normally.

Intended Audience

This document was prepared for customers who have purchased Compaq StorageWorks Enterprise/Modular Storage RAID Array products that include Compaq StorageWorks HSG80 RAID Array Controllers. This document also serves as a reference for Compaq Customer Services personnel responsible for installing and maintaining systems that include the Compaq StorageWorks HSG80 RAID Array Controller.

Conventions

The following terms are used throughout this document:

- Unless otherwise specified, all references to controllers or array controllers imply the Compaq StorageWorks HSG80 RAID Array Controller.
- Unless otherwise specified, all references to Compaq StorageWorks Array Controller Software (ACS) Version 8.6 imply the released Compaq StorageWorks ACS Version 8.6-1 code, or subsequently patched versions of ACS Version 8.6.
- For the purpose of this document, Enterprise/Modular Storage RAID Array refers to the following Compaq StorageWorks RAID Array products:
 - RA8000 — Fibre Channel RAID Array 8000
 - ESA12000 — Enterprise Storage Array 12000 Fibre Channel
 - MA8000 — Modular Array 8000 Fibre Channel
 - EMA12000 — Enterprise Modular Array 12000 Fibre Channel
 - EMA16000 — Enterprise Modular Array 16000 Fibre Channel

Release Package Contents

This HSG80 Fibre Channel Solution Software Kit consists of the following:

- The HSG80 Solution Software documentation set:
 - *HSG80 ACS Solution Software Version 8.6 for Windows NT and Windows 2000 Installation and Configuration Guide*
 - *HSG80 Array Controller ACS Version 8.6 CLI Reference Guide*
 - *HSG80 Array Controller ACS Version 8.6 Maintenance and Service Guide*
 - *HSG80 Array Controller ACS Version 8.6 Troubleshooting Reference Guide*
 - *Command Console Version 2.4 User Guide*

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- ❑ *Command Console Version 2.4 Release Notes*
- ❑ *StorageWorks Registration and Warranty Package*
- ❑ *Enterprise/Modular Storage RAID Array Fibre Channel Cluster for Windows NT/Windows 2000 Installation Guide*
- ❑ *Installing the Integration Patch for Compaq Insight Manager and ACS Version 8.6 or Later*
- ❑ *HSG80 ACS Solution Software Version 8.6B for Windows 2000 Datacenter Installation and Configuration Guide (specific to Datacenter installations)*
- ❑ *HSG80 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.6B for Windows NT and Windows 2000 Release Notes (this document)*
- ❑ *HSG80 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.6B for Windows 2000 Datacenter Release Notes (specific to Datacenter installations)*
- **HSG80 Modular Storage RAID Arrays Solution Software V8.6B for Windows NT, Windows 2000 and DataCenter 2000 on Proliant & x86 Platforms CD-ROM**

The following supporting documentation is available from the Compaq StorageWorks website:

<http://www.compaq.com/storage/index.html>

- *Heterogeneous Open SAN Design Reference Guide, Part Number: AA-RMPNC-TE*
- *Model 2100 and 2200 Ultra SCSI Controller Enclosures User Guide, Part Number: EK-SE2C8-UA. C01*
- *Model 4300 Family Ultra3 LVD Disk Enclosures User Guide, Part Number: EK-LVDU3-UA. A01*
- *Modular Array Cabinet Restrictions, Part Number EK-MACON-CA. B01*
- *Enterprise/Modular Storage RAID Array FC-AL HA Configurations for Windows NT/Windows 2000 - Intel Application Note, Part Number: AA-RHOSE-TE*
- *Enterprise/Modular Storage RAID Array FC-AL Configurations for Windows NT/Windows 2000 Application Note, Part Number: AA-RHORC-TE*

Important Notice Regarding Cache Sizes

Due to the increased host connectivity delivered with ACS Version 8.6F, you must observe new cache size requirements. When upgrading from ACS Version 8.5 to ACS Version 8.6, cache module configurations must be upgraded from the prior minimum of 64 MB (ACS 8.5) to 128 MB in unmirrored configurations, and 256 MB in mirrored configurations, per cache module.

The cache size requirements for running ACS Version 8.6P or Version 8.6S have not changed, and remain at 512 MB.

Identifying ACS Revision Level

The ACS release package you received should include a Personal Computer Memory Card Industry Association (PCMCIA) program card containing the new ACS software. Included in this section are instructions for determining the ACS version running on your RAID Array.

Once ACS is installed, you can identify the specific version of ACS by typing the following command at the Command Line Interpreter (CLI) prompt:

```
HSG80> SHOW THIS_CONTROLLER
```

The resulting display lists the software revision level as one of the following:

```
V86F-1
```

```
V86P-1
```

```
V86S-1
```

If the ACS version is not Version 8.6x-1 or a subsequently patched version of ACS Version 8.6, contact your support provider for instructions on how to obtain the updated version.

If the ACS version is Version 8.6P-1 or Version 8.6S-1, you will need additional layered application software beyond this Solution Software Kit to take advantage of the added functionality of these versions.

ACS Version 8.6x-1 is fully compatible with Version 8.6 Solution Software. In addition, Version 8.6 Solution Software is backward compatible with ACS Version 8.5, which allows rolling upgrades to be performed on most operating systems. See the "Rolling Upgrades" Section, page 31, for more information.

HSG80 Device Removal and Replacement

This section provides rules for HSG80 support of Device Removal/Replacement (“Hot Swap”), defines Device Hot Swap and how to invoke Device Warm Swap.

Device Hot or Warm Swap

In all cases (Disk Device Hot Swap or Warm Swap), the disk device to be removed must be removed from any unit association and storagesets (including mirrorsets, failedsets or sparesets) prior to initiating physical removal. Use the following command options:

```
HSG80> DELETE <unit>
    or
HSG80> REDUCE <storageset member>
NOTE: For mirrorsets or RAIDsets.
HSG80> DELETE <storageset>
    or
HSG80> SET M1 REMOVE=DISKnnnnn
HSG80> DELETE DISKnnnnn
```

Device Hot Swap

Disk Device Hot Swap is supported only when the following conditions are met:

- The controllers are not engaged in failover or failback.
- The controllers are not running a local program, such as DILX or VTDPY.
- The controller CLI prompt is accessible (for example, another CLI command is not being processed).
- If the drive being removed or replaced is physically being moved to a new port or target location on the same controller, you must wait a minimum of 60 seconds before re-inserting the device into its new location.
- If the controller is in the process of recognizing or processing one or more hot drive insertions, the controller must be allocated enough time to do proper device discovery for both operations. The busier the controller, the longer the waiting time will be. As a rule of thumb, during the replacement of one drive at a time, waiting 60 seconds between physical removal/replacement operations is typical.

Device Warm Swap

When Disk Device Hot Swap is not applicable, Disk Device Warm Swap should be used. From a data integrity perspective, the best method of physically removing a device in a parallel bus multi-drop architecture (such as a SCSI bus) is to use the Warm Swap process. With the HSG80 family of storage systems, this involves quiescing the device bus for which the device will be removed or replaced.

This activity provides a momentary stall on that bus, while work continues on the adjacent bus. Promptly execute the removal or insertion procedure so that the internal detect “swap signal” terminates the quiesce functionality.

1. Press the appropriate port button on the Operator Control Panel (OCP) until the I/O quiesces on the bus.
2. Remove the disk device.
3. Repeat the above steps to replace a disk device.

Procedural Example

Here is an example of selecting a device in a storageset, and taking the appropriate measures to removing the physical device from the storage system.

1. Verify that disk device (diskxxxxxx) is not a member of a storageset (such as RAID 0, 1, 0+1 or 3/5) by typing:

```
HSG80> SHOW DISKxxxxxx
```

2. Verify physical location of disk drive by typing the following command:

```
HSG80> LOCATE DISKxxxxxx
```

Verify that the disk drive amber light (fault LED) flashes once per second. It is considered best practice to put a physical mark on the drive.

3. Type the following command:

```
HSG80> LOCATE CANCEL
```

Verify that the disk drive amber light turns OFF.

4. On the HSG80 controller, press the port button of the physical port containing the disk device to be removed.

Press the port button in for about 2 seconds and then release. When the action is recognized by the controller, all the port lights on the controller bulkhead will momentarily flash on for about 1 second. The port light on the controller will begin to pulse.

NOTE: Care should be taken to press the port button on the OCP for the correct port.

5. Wait for port to quiesce

Go to the side of the cabinet where you will remove the drive and wait approximately 10-15 seconds. The port is quiesced, when all the disk devices on that port show a flashing amber LED.

NOTE: If a drive on that port has the LOCATE light function enabled, the drive LED for that device will be on SOLID until the quiesce sequence is over, at which time it will begin to flash and the other devices will cease flashing.

6. Promptly pull the physical drive about one inch out, then give the drive time to spin-down (60 seconds). Complete the physical removal of the drive.

Both controllers port lights will remain on and the disk device lights will go off. Within about 20 seconds of device removal, the device activity should begin to resume on the remaining units. The period of time is load dependent.

7. Insert the replacement disk device part way into the slot. Verify that a minimum of 2 minutes have passed since drive removal.

8. On the HSG80 controller, press the port button of the physical port containing the removed disk device.

Press the port button for about 2 seconds, then release. When the action is recognized by the controller all the port lights on the controller bulkhead will momentarily flash for about 1 second. Then the port light on the controller will begin to pulse.

NOTE: Care should be taken to press the port button on the OCP for the correct port.

9. Wait for the port to quiesce.

Go to the side of cabinet where you removed the disk drive from and wait approximately 10-15 seconds. The port is quiesced, when ALL the disk devices on that port will have a flashing amber LED.

10. Physically push the drive completely into the shelf. Make sure there is contact with the backplane.

Within about 20 seconds of device insertion, the device activity to other storage should resume. Both controllers port lights will turn off and the disk device lights will go off if there are no disk device faults on that port.

New Features

This section briefly describes new features that are supported by this Version 8.6B release of the Solution Software, together with the array controller running ACS Version 8.6 code.

FC Switch Firmware Upgrade

The primary focus of this Solution Software update is to support the newly available FC Switch Firmware upgrade to Version 2.6. The new firmware provides the following:

- FabricWatch support, which offers switch management and monitoring features.
- Support for newer operating system versions, and higher levels of cooperation between operating systems in heterogeneous SANs.
- User-configurable resource allocation and error detection timeout values (RATOV and EDTOV, respectively), which improves synchronization across the SAN.

NOTE: Compaq recommends that you do not mix switch firmware versions in your SAN. It is considered best practice to uniformly upgrade all switches in the SAN.

IMPORTANT: For Windows 2000 Datacenter configurations, SAN Switch firmware Version 2.1.9m is the latest certified version. For Microsoft Multicluster configurations, SAN Switch firmware Version 2.1.9g is the latest certified version.

Solution Software Updates

The following improvements have been added to your Solution Software:

- Upgraded HBA drivers for Windows NT and Windows 2000 to Version 4-4.53a7 and Version 5-4.53a7, respectively. This provides improved timeout values required by the switch firmware upgrade.
- Upgraded Compaq DS-KGPSA-CB HBA firmware to Version 3.82a1, BIOS Version 1.60a4.
- Added Windows 2000 Datacenter support:
 - Solution Software will automatically detect the operating system to ensure proper installation.
 - Separate Datacenter documents are included for Datacenter installations.
- The Solution Software installation program can now perform new installations, or replace existing installations without requiring uninstallation of pre-existing components.
- HsgCCL.inf is now digitally signed by Microsoft for use with Windows 2000.
- Changed driver parameter `SimulateDevice` value to 1, which adds functionality for viewing KGPSA adapter properties and configuration without storage attached.

New Array Hardware Support

Support for the following hardware has been added:

- EMA16000 — Enterprise Modular Array 16000 Fibre Channel
- 72GB Hot-Pluggable 10K RPM, Wide Ultra3 SCSI, SCA-2, 1.0-inch Hard Drive

Documentation Updates

The following data items have been added as an enhancement to these Release Notes:

- "HSG80 Device Removal and Replacement" Section, page 8, which defines rules and procedures for Device Hot Swap and Device Warm Swap.
- "Switch Support" Section, page 18, which lists FC switches and firmware supported by this Solution Software.
- "SWCC Scalability" Section, page 21, "Multiple Agents" Section, page 21, and "Multiple Management Sessions" Section, page 21, which clarify the use and limitations of SWCC.
- "Solution Software Upgrade Procedures" Section, page 23, which help clarify the requirements for host-related storage system upgrades.
- "Upgrading DS-KGPSA-BC Firmware" Section, page 41, which provides detailed instructions on upgrading the DS-KGPSA-BC HBA firmware from Version 2.x to Version 3.x (for example, v2.20x7 to v3.20x7).

Modular Array Solutions

The modular solution consists of the array controller (single or dual configurations) installed in a Model 2200 Ultra SCSI controller enclosure and the drives installed in either a Model 4314 disk enclosure or a Model 4354 disk enclosure. The modular solutions must be mounted in RETMA cabinets. The Compaq RETMA cabinets are available in heights of 42U, 41U, 36U and 22U. The Model 2200 Ultra SCSI controller enclosure is 4U. The Model 4314 disk enclosure and the Model 4354 disk enclosure are each 3U. This combination allows for several cabinet configurations.

NOTE: If you wish to use a controller from an existing RA8000 or ESA12000 storage system, the Cache Bulkhead upgrade for installation of the controller in the Model 2200 is required.

- For information about how to install the array controller in a Model 2200 Ultra SCSI controller enclosure, see the *Model 2100 and 2200 Ultra SCSI Controller Enclosures User Guide*.

- For information about how to install drives in either a Model 4314 disk enclosure or a Model 4354 disk enclosure, see the *Model 4300 Family Ultra3 LVD Disk Enclosures User Guide*.
- For information about modular solution configurations and restrictions, see the *Modular Array Cabinet Restrictions* user document.

Disk Enclosures

The array controller firmware can now address up to 14 disks per SCSI bus. The maximum number of disks supported by an array controller (single or cooperating pair) is 84. The disk enclosures can be configured for single bus or for dual bus.

NOTE: The 43xx disk enclosures do not allow daisy chaining between shelves.

Table 1 Single Bus Mode Enclosure Options

Disk Enclosures Options/Single Bus Mode	Part Number
Model 4310R — Rack-mountable 10-drive enclosure with single bus, single power supply	174631-B21
Model 4314R — Rack-mountable 14-drive enclosure with single bus, single power supply	190209-001
Model 4314T — Tower mount 14-drive enclosure with single bus, single power supply, LCD monitor	190210-001
Second Power Supply for 4314 (Adds a redundant power supply to the 4314)	119826-B21
Single Bus I/O Module for existing 4314	190212-B21
Dual Bus I/O Module for Existing 4314 (Changes the 4314 from a single bus to a dual bus)	119829-B21

Table 2 Dual Bus Mode Enclosure Options

Disk Enclosures Options/Dual Bus Mode	Part Number
Model 4350R — Rack-mountable 10-drive enclosure with dual bus, dual power supply	174630-B21
Model 4354R — Rack-mountable 14-drive enclosure with dual bus, dual power supply	190211-001

NOTE: Use a single bus I/O module to transform a Model 4354 disk enclosure to single bus.

SCSI Cables

SCSI Cables must be ordered separately for connection of the 43xx shelves to the Model 2200 enclosure. The following SCSI cables are supported.

Table 3 SCSI Cable Options

SCSI Cable Options	Part Number
1 meter SCSI cable	168256-B21
2 meter SCSI cable	168258-B21
3 meter SCSI cable	189505-B21
5 meter SCSI cable	400983-005
10 meter SCSI cable	400983-010

Ordering Modular Storage Systems

The Modular Array/Enterprise Modular Array storage systems can be ordered one of three ways.

- Predefined models are available that provide a set number of controller shelves and drive shelves in a Modular Storage Cabinet:
 - ❑ MA8000: One Model 2200 controller enclosure and three dual bus Model 4354 disk enclosures in a 22U Modular Storage Cabinet
 - ❑ EMA12000 D14: Three Model 2200 controller enclosures and nine dual bus Model 4354 disk enclosures in a 42U Modular Storage Cabinet
 - ❑ EMA12000 S14: One Model 2200 controller enclosure and six single bus Model 4314 disk enclosures in a 36U Modular Storage Cabinet
 - ❑ EMA12000 Blue: One Model 2200 controller enclosure and three dual bus Model 4354 disk enclosures in a 41U Modular Storage Cabinet
 - ❑ EMA16000 S14: Two Model 2200 controller enclosures and twelve single bus 4314 disk enclosures in a 41U Modular Storage Cabinet
 - ❑ EMA16000 D14: Four Model 2200 controller enclosures with twelve dual bus 4354 disk enclosures in a 41U Modular Storage Cabinet
- NOTE:** The predefined models require the following options: Controllers, External Cache Batteries (ECBs), Controller firmware and drives.
- Configure-to-Order. Allows you to specify the number of controller shelves and drive shelves desired in a Modular Storage Cabinet.

- Assembly onsite. Allows you to order the components separately and install them in any supported RETMA rack or cabinet.

Hardware and Software Support

This section lists the hardware, devices and operating system versions that are compatible with this Fibre Channel Solution Software Kit.

Array Hardware Support

The following Enterprise/Modular Storage RAID Array hardware products are supported by this Fibre Channel Solution Software Kit:

- DS-SW600-AA—600-mm wide cabinet 50/60 Hz, dual-redundant controllers, bolting kit for coupling (two SW600 cabinets)
- DS-SW370-AA—RAID pedestal, five 180-watt power supplies; eight universal 50/60 Hz, 120/240V high-powered blowers; one AC input box; one enhanced EMU; one pedestal user's guide; six single-ended I/O modules
- DS-SW370-EA—RAID pedestal; five 180-watt power supplies; eight universal 50/60 Hz, 120/240V high-powered blowers; one AC input box; one enhanced EMU; one pedestal user's guide; six single-ended I/O modules; metric mounting hardware
- DS-BA370-AA—RAID rackmount enclosure; five 180-watt power supplies; eight universal 50/60 Hz, 120/240V high-powered blowers; one AC input box, six single-ended I/O modules; one pedestal user's guide; one enhanced EMU; one PVA, metric mounting hardware
- DS-BA370-MA—Maintenance Option for the SW370 and BA370 field service Option, field-replaceable unit (FRU)
- DS-BA35X-HH—180-watt, 100- to 200-V power supply; 240-V, AC factor-corrected power supply; blue color carrier
- DS-BA35X-MK—High-powered blower for the SW370 and BA370
- DS-BA35X-MP—Termination module
- DS-BA35X-BA—External cache battery shelf for SW370
- DS-BA35X-BC—Single battery in blue SBB
- DS-BA35X-BD—Double battery in blue SBB
- DS-BA35X-EB—Enhanced Environmental Monitor Unit of the SW370 and BA370
- DS-BA35X-MN—Single-ended, Ultra SCSI I/O module

- DS-BA35X-EC—Power verification and addressing module
- HS35X-BA—Single external cache battery in an SBB
- HS35X-BD—Dual external cache battery in an SBB
- DS-HSDIM-AB 64 MB Cache upgrade for HSX80
- DS-HSDIM-AC 256 MB Cache upgrade for HSX80

Disk Device Support

This Fibre Channel Solution Software Kit supports the disk devices listed in Table 4 at the indicated hardware and microcode levels.

IMPORTANT: All new Universal SCSI disk drives sold by Compaq come with an 8 MB EISA style partition at the start of the disk. This includes new StorageWorks SBB drives, which contain the basic universal disk drive brick internally. The EISA partition, when left on the media, is presented to a host at the storage unit level by the HSG80 storage system. Some hosts and applications may misinterpret this information. In order to resolve this potential issue, approximately 8 MB needs to be erased from the beginning of the disk. See the "Windows NT Specific Notes" Section, page 44, for details.

Table 4 Supported Disk Drives

Part Number	Device/Model	Capacity (GB)	Spindle Speed (RPM)	Minimum Microcode Version	Minimum Hardware Version
232431-003 233806-004	BD07264546 BD0726459C	72.8	10,000	BDC7	A01
176494-B21	BC072638A2	72.8	10,000	BDC7	A01
176496-B22	BD03663622 BD0366349C BD036635C5	36.4	10,000	BDC4 3B02 B020	A01 A01 A05
180726-006	BD036735C8	36.4	10,000	B020	A01
127968-001	DS-RZ1FC-VW	36.4	10,000	3B02/2B07/ B020/BDC4	A01

Table 4 Supported Disk Drives (Continued)

Part Number	Device/Model	Capacity (GB)	Spindle Speed (RPM)	Minimum Microcode Version	Minimum Hardware Version
147599-001	DS-RZ1FB-VW	36.4	7,200	N1H1/0372/ 1614/3B06	A01
188122-B22	BF01863644	18.2	15,000	3B01	A01
188120-B22	BF00963643	18.2	15,000	3B01	A01
180726-002	BD018635C4	18.2	10,000	B020	A01
180726-005	BD018735C7	18.2	10,000	B020	A01
380589-B21	DS-RZ1ED-VW	18.2	10,000	0306/1614/ 3B07/B020/ BDC4	A01
128418-B22	BD018122C9	18.2	10,000	B016	A01
142673-B22	BD01862376 BD01862A67	18.2	10,000	BCJE B007	A01
147598-001	DS-RZ1EA-VW	18.2	7,200	3B05	A01
380694-B21	DS-RZ1EF-VW	18.2	7,200	N1H1/ 0372	A01
388144-B22	BB01811C9C	18.2	7,200	3B05	A01
380588-B21	DS-RZ1DD-VW	9.1	10,000	0306/1614/ 3B07/B020/ BDC4	A01
328939-B22	BD009122BA	9.1	10,000	3B07	A01
142671-B22	BD00962373 BD00962A66	9.1	10,000	BCJE B007	A01
180726-001	BD009635C3	9.1	10,000	B020	A01
180726-004	BD009735C6	9.1	10,000	B020	A01
147597-001	DS-RZ1DA-VW	9.1	7,200	3B05	A01

Table 4 Supported Disk Drives (Continued)

Part Number	Device/Model	Capacity (GB)	Spindle Speed (RPM)	Minimum Microcode Version	Minimum Hardware Version
380595-B21	DS-RZ1DF-VW	9.1	7,200	N1H1/0372/1614	A01
123065-B22	BB00911CA0	9.1	7,200	3B05	A01
380693-B21	DS-RZ1DB-VW	9.1	7,200	LYJ0/0307	A01
N/A	DS-RZ1CD-VW	4.3	10,000	0306	A01
N/A	DS-RZ1CB-VW	4.3	7,200	LYJ0/0656	A01
380691-B21	DS-RZ1CF-VW	4.3	7,200	N1H1/1614	A01

Switch Support

This Fibre Channel Solution Software Kit supports the StorageWorks Fibre Channel Switches and firmware versions listed in Table 5.

NOTE: Compaq recommends that you do not mix switch firmware versions in your SAN. It is considered best practice to uniformly upgrade all switches in the SAN.

Table 5 Fibre Channel Switch Support

Description	Part Number	Firmware Version
8 Port Fibre Channel Storage Switch (see Note)	DS-DSGGA-AA 380591-B21	1.6d
16 Port Fibre Channel Storage Switch (see Note)	DS-DSGGA-AB 380578-B21	1.6d
SAN Switch 8 (8 Port Fibre Channel)	DS-DSGGB-AA 158222-B21	2.6
SAN Switch 16 (16 Port Fibre Channel)	DS-DSGGB-AB 158223-B21	2.6
SAN Switch 8-EL (8 Port Fibre Channel)	DS-DSGGC-AA 176219-B21	2.6
SAN Switch 16-EL (16 Port Fibre Channel)	DS-DSGGC-AB 212776-B21	2.6

Table 5 Fibre Channel Switch Support (Continued)

SAN Switch Integrated 32 Port Fibre Channel	DS-DSGGS-AA 230616-B21	2.6
SAN Switch Integrated 64 Port Fibre Channel	DS-DSGGS-AB 230617-B21	2.6

NOTE: The 8/16 Port Fibre Channel Storage Switches (DS-DSGGA-AA and DS-DSGGA-AB) are limited to a maximum of a four switch, two hop configuration.

IMPORTANT: For Windows 2000 Datacenter configurations, SAN Switch firmware Version 2.1.9m is the latest certified version. For Microsoft Multicluster configurations, SAN Switch firmware Version 2.1.9g is the latest certified version.

For the latest versions of switch firmware, please visit the Compaq website:

<http://www.compaq.com/products/storageworks/fcsanswitch816/firmware.html>

System Components

This Fibre Channel Solution Software Kit supports the system components and operating system versions listed in Table 6.

Table 6 Minimum System Requirements

Component	Requirement
Controller Compatibility	Compaq StorageWorks HSG80 Array Controller, ACS Version 8.6F-1 (or a subsequently patched version of ACS Version 8.6F) Note: Only for the purpose of performing upgrades to the ACS firmware, this Solution Software Kit supports ACS Version 8.5. Compaq does not recommend mixing ACS versions in the same SAN.
Platform	Intel and ProLiant X86 Servers
Operating System	Microsoft Windows NT 4.0, Service Pack 6A Microsoft Windows 2000, Service Pack 1 Microsoft Cluster Server
Topology	Fibre Channel Switched (FC-SW) and Arbitrated Loop (FC-AL) Modes
SCSI Protocol	SCSI-2 SCSI-3 (recommended)

Table 6 Minimum System Requirements (Continued)

Failover Mode	Transparent Multiple-Bus (requires Secure Path software)
Free Disk Space	5 MB
Adapter Compatibility	Compaq PCI FC Host Bus Adapter DS-KGPSA-BC, HBA driver V4-4.53a7 (NT) or V5-4.53a7 (W2K), Firmware Version 3.20x7 Compaq PCI FC Host Bus Adapter DS-KGPSA-CB, HBA driver V4-4.53a7 (NT) or V5-4.53a7 (W2K), Firmware Version 3.82a1/BIOS Version 1.60a4

IMPORTANT: When upgrading firmware on the DS-KGPSA-BC HBA from Versions 2.x to Versions 3.x, please follow the procedure defined in the "Upgrading DS-KGPSA-BC Firmware" Section, page 41, of these Release Notes.

Notes

1. HsxDisk.sys and HszDisk.sys are required drivers for array controller configurations. The Solution Software CD-ROM that came with your kit includes the following versions of these drivers:
 - HsxDisk.sys Version 4.4.0.9 for Windows NT 4.0
 - HsxDisk.sys Version 5.4.21 for Windows 2000
2. If you see a constantly blinking light on your Fibre Channel Switch, the topology setting may be set to arbitrated loop mode in your server. To correct this, remove the existing installation of the Fibre Channel Software and reinstall the desired setup.

StorageWorks Command Console

StorageWorks Command Console (SWCC) Version 2.4 is included in this release. Version 2.4 is used to identify the SWCC suite of components. The Agent, a component of the SWCC product, is delivered at Version 2.3.2.

SWCC provides a graphical user interface that can be used to configure and monitor your storage system. Use of SWCC is highly recommended, but not required. The SWCC Agent is installed as part of the Solution Software Kit.

For more information on SWCC installation, see the *HSG80 ACS Solution Software Version 8.6 Installation and Configuration Guide*. For more information on SWCC Client operation, refer to *Command Console Version 2.4 User Guide* and *Command Console Version 2.4 Release Notes*.

SWCC Scalability

- The SWCC Client can monitor up to 128 host systems, each with up to 32 storage systems, for a maximum of 4096 concurrent storage connections and a total of 2.65 PB of storage.
- One Agent can support up to 32 Clients.

Multiple Agents

This Solution Software Kit contains an SWCC Agent that supports controller locking during CLI command execution, which allows support for multiple Agents. This feature is required in order to use the SANworks Management Appliance in addition to the host-based SWCC Agent. However, it is not recommended or required to use multiple Agents for any other purpose.

NOTE: As a reference, SWCC Agent Version 2.3.2, Build 77 or higher supports the locking feature. This release of Solution Software meets or exceeds this requirement.

Multiple Management Sessions

IMPORTANT: Though multiple Clients can be used to monitor your storage system, Compaq recommends that only one instance of storage system management be active at a time. The Client does allow for multiple management sessions, but there are no ownership rights given to any particular session. Without a highly coordinated effort, multiple management sessions can undermine the integrity of system maintenance. This same principle applies to multiple management sessions initiated through the SANworks Management Appliance as well.

SWCC Client Installation

The SWCC Client software is installed on your host system from the StorageWorks Solution Software CD-ROM.

1. Insert the Solution Software CD-ROM into the host system. A menu appears on your screen.

2. If the program does not start automatically after inserting the CD-ROM, go to the CD-ROM drive directory and run the `install.bat` file.
3. The installation program provides one primary option: Solution Software V8.6B for Windows NT/2000.
 - a. If you are just installing SWCC, skip the driver upgrade screen.
 - b. Select SWCC to install.
 - c. Choose “HSG80ACS85 Controller for ACS85 new” and complete the installation as prompted.

Secure Path Software

Secure Path is a high availability, multiple-bus software application that supports FC-SW connectivity. This Fibre Channel Solution Software Kit supports the Secure Path software shown in Table 7.

Table 7 Secure Path Compatibility

Operating System	Supported Product Version
Windows NT 4.0 Service Pack 6A	Versions 2.2.2, 3.1A Service Pack 1
Windows 2000 Service Pack 1 and 2	Version 3.1A Service Pack 1

For more information on Secure Path software, see the product documentation that comes with the product, or visit the Compaq website:

<http://www.compaq.com/products/sanworks/secure-path/index.html>

Layered Software Applications

Compatibility with Compaq StorageWorks and SANworks layered software applications is defined in Table 8.

Table 8 Layered Application Compatibility

Application	Version	ACS Requirement
Data Replication Manager (DRM)	Version 8.6P	Version 8.6P
Enterprise Volume Manager (EVM)	Version 2.0	Version 8.6F/S/P
Storage Resource Manager (SRM)	Version 4.01	Version 8.6F
Command Scriptor	Version 1.0	Version 8.6F
Virtual Replicator	Version 2.0A	Version 8.6F
Management Appliance	Version 1.0A	Version 8.6F
Storage Allocation Reporter	Version 1.0	Version 8.6F

In cases where ACS functional builds other than Version 8.6F are indicated, ensure all required components for those configurations are at the proper level prior to upgrading your ACS code.

Running EVM with ACS Version 8.6F affords you scripting with CLONES. If you want to run SNAPSHOTs with EVM, you must be running ACS Version 8.6S or 8.6P code.

For more information on these and other Storage Management software, see the product documentation that comes with the product, or visit the following Compaq website:

http://www.compaq.com/products/storageworks/storage_mgmt_software.html

Solution Software Upgrade Procedures

Use the following procedures for upgrades to your Solution Software. It is considered best practice to perform backups, quiesce all I/O and unmount all file systems before proceeding.

NOTE: Only for the purpose of performing upgrades to the ACS firmware, this Solution Software Kit supports ACS Version 8.5. Compaq does not recommend mixing ACS versions in the same SAN.

IMPORTANT: When upgrading firmware on the DS-KGPSA-BC HBA from Versions 2.x to Versions 3.x, please follow the procedure defined in the "Upgrading DS-KGPSA-BC Firmware" Section, page 41, of these Release Notes.

Your Solution Software will automatically detect the operating system to ensure proper installation.

IMPORTANT: If updating ACS firmware, the upgrade should be completed after all Windows server upgrades. Be sure to back up data before updating servers.

NOTE: See the *HSG80 ACS Solution Software Version 8.6 Installation and Configuration Guide* for additional details on storage configurations. Fibre cabling should be disconnected before proceeding.

Multiple-Bus Configurations

The following procedures are applicable to multiple-bus failover configurations only (Secure Path Software required). These procedures are only applicable to Secure Path Version 3.x products and upgrades, and requires Secure Path Version 3.1A Service Pack 1.

To obtain Service Pack 1 for Secure Path Version 3.1A, please visit the Compaq website:

<http://www.compaq.com/products/sanworks/secure-path/index.html>

New Installations

1. Using your Solution Software CD-ROM, click the **Solution Software v8.6B for Windows NT/2000** link.
 - a. Click the **KGPSA Driver Update** link to install the HBA driver.
 - b. Click the **Fibre Channel Software Setup** link, then choose one of the Fibre Channel setups, based on your configuration.
 - c. Click the **SWCC** link (optional) to install SWCC components.

IMPORTANT: Do Not Restart the server at this time.

2. Using your Secure Path Software CD-ROM, install Secure Path 3.1A in accordance with the instructions provided with that product. Then apply the Secure Path 3.1A Service Pack 1 download.

3. Restart the server.

Updating Solution Software on a Windows NT or Windows 2000 Server Running Secure Path Software

The following procedures demonstrate how to upgrade your Solution Software in a multiple-bus failover environment, without changing the existing Secure Path Software.

IMPORTANT: When updating a Windows NT or Windows 2000 server configuration, Secure Path must also be updated to Version 3.1A Service Pack 1 in order to successfully update the KGPSA HBA driver.

If you need to upgrade your Solution Software, in conjunction with Secure Path Software, follow the procedures found in the "Updating Solution Software and Secure Path on a Windows NT or Windows 2000 Server" Section, page 27, of these Release Notes.

NOTE: Secure Path will not be removed during this process. For updating instructions regarding Secure Path only, see the latest Secure Path Release Notes or Web release, found on the Compaq website.

<http://www.compaq.com/products/sanworks/secure-path/index.html>

Updating an Existing Standalone Server

Be sure you are logged in on an account with administrator privileges.

1. Stop all applications that access Secure Path storage.
2. Stop Steam Agent (SWCC) in **Services**.
3. Using the **Add/Remove Program** in Control Panel, uninstall:
 - a. StorageWorks Command Console (SWCC)
 - b. Large LUN Utility (if installed)

IMPORTANT: Do not Restart the server at this time.

4. Using your Solution Software CD-ROM, click the **Solution Software v8.6B for Windows NT/2000** link.
 - a. Click the **KGPSA Driver Update** link to install the HBA driver.
 - b. Click the **Fibre Channel Software Setup** link, then choose one of the Fibre Channel setups, based on your configuration.

- c. Click the **SWCC** link (optional) to install SWCC components.

NOTE: The latest Large LUN utility must be installed if the storage system will be used prior to upgrading ACS to Version 8.6, and a Large LUN configuration was previously employed.

5. Restart the server.

Updating an Existing Cluster

Be sure you are logged in to the server with no disk resources using an account with administrator privileges.

1. Using **Cluster Administrator**, make note of your original configuration, then move disk resources to the other cluster node. The node being updated should not have any disk resources online. Using Cluster Manager, set all Cluster Groups to **Prevent Failback** while the upgrade is taking place.

IMPORTANT: Cluster Service must continue to run on all nodes. Stopping the Cluster Service during this procedure could result in a Cluster Service failure, and subsequent reinstallation.

2. Stop Steam Agent (SWCC) in **Services**.
3. Using the **Add/Remove Program** in Control Panel, uninstall:
 - a. StorageWorks Command Console (SWCC).
 - b. Large LUN Utility (if installed)

IMPORTANT: Do not Restart the system at this time.

4. Using your Solution Software CD-ROM, click the **Solution Software v8.6B for Windows NT/2000** link.
 - a. Click the **KGPSA Driver Update** link to install the HBA driver.
 - b. Click the **Fibre Channel Software Setup** link, then choose one of the Fibre Channel setups, based on your configuration.
 - c. Click the **SWCC** link (optional) to install SWCC components.

NOTE: The latest Large LUN utility must be installed if the storage system will be used prior to upgrading ACS to Version 8.6, and a Large LUN configuration was previously employed.
5. Restart the updated cluster node.
6. Repeat *Step 1* through *Step 5* for the next cluster node.

7. Once all cluster nodes have been upgraded, using **Cluster Administrator**, restore all Cluster Groups to their original **Prevent Failback** setting, and restore storage groups to their original configuration.

Updating Solution Software and Secure Path on a Windows NT or Windows 2000 Server

The following procedures demonstrate how to upgrade your Solution Software, in conjunction with your Secure Path Software, in a multiple-bus failover environment.

Updating an Existing Standalone Server

Be sure you are logged in on an account with administrator privileges.

1. Stop all applications that access Secure Path storage.
2. Stop Steam Agent (SWCC) in **Services**.
3. Using the **Add/Remove Program** in Control Panel, uninstall:
 - a. StorageWorks Command Console (SWCC)
 - b. Large LUN Utility (if installed)

IMPORTANT: Do not Restart the server at this time.

4. Using your Secure Path Software CD-ROM, install Secure Path 3.1A in accordance with the instructions provided with that product. Then apply the Secure Path 3.1A Service Pack 1 download.
5. Using your Solution Software CD-ROM, click the **Solution Software v8.6B for Windows NT/2000** link.
 - a. Click the **KGPSA Driver Update** link to install the HBA driver.
 - b. Click the **Fibre Channel Software Setup** link, then choose one of the Fibre Channel setups, based on your configuration.
 - c. Click the **SWCC** link (optional) to install SWCC components.

NOTE: The latest Large LUN utility must be installed if the storage system will be used prior to upgrading ACS to Version 8.6, and a Large LUN configuration was previously employed.
6. Restart the server.

Updating an Existing Cluster

Be sure you are logged in to the server with no disk resources using an account with administrator privileges.

1. Using **Cluster Administrator**, make note of your original configuration, then move disk resources to the other cluster node. The node being updated should not have any disk resources online. Using Cluster Manager, set all Cluster Groups to **Prevent Failback** while the upgrade is taking place.

IMPORTANT: Cluster Service must continue to run on all nodes. Stopping the Cluster Service during this procedure could result in a Cluster Service failure, and subsequent reinstallation.

2. Stop Steam Agent (SWCC) in **Services**.
3. Using the **Add/Remove Program** in Control Panel, uninstall:
 - a. StorageWorks Command Console (SWCC).
 - b. Large LUN Utility (if installed)

IMPORTANT: Do not Restart the system at this time.

4. Using your Secure Path Software CD-ROM, install Secure Path 3.1A in accordance with the instructions provided with that product. Then apply the Secure Path 3.1A Service Pack 1 download.
5. Using your Solution Software CD-ROM, click the **Solution Software v8.6B for Windows NT/2000** link.
 - a. Click the **KGPSA Driver Update** link to install the HBA driver.
 - b. Click the **Fibre Channel Software Setup** link, then choose one of the Fibre Channel setups, based on your configuration.
 - c. Click the **SWCC** link (optional) to install SWCC components.

NOTE: The latest Large LUN utility must be installed if the storage system will be used prior to upgrading ACS to Version 8.6, and a Large LUN configuration was previously employed.

6. Restart the updated cluster node.
7. Repeat *Step 1* through *Step 6* for the next cluster node.
8. Once all cluster nodes have been upgraded, using **Cluster Administrator**, restore all Cluster Groups to their original **Prevent Failback** setting, and restore storage groups to their original configuration.

Transparent Failover Configurations

The following procedures are applicable to transparent failover configurations only.

New Installations

1. Using your Solution Software CD-ROM, click the **Solution Software v8.6B for Windows NT/2000** link.
 - a. Click the **KGPSA Driver Update** link to install the HBA driver.
 - b. Click the **Fibre Channel Software Setup** link, then choose one of the Fibre Channel setups, based on your configuration.
 - c. Click the **SWCC** link (optional) to install SWCC components.
2. Restart the server.

Updating an Existing Standalone Server

Be sure you are logged in on an account with administrator privileges.

1. Stop all applications that access storage.
2. Stop Steam Agent (SWCC) in **Services**.
3. Using the **Add/Remove Program** in Control Panel, uninstall:
 - a. StorageWorks Command Console (SWCC)
 - b. Large LUN Utility (if installed)

IMPORTANT: Do not Restart the server at this time.

4. Using your Solution Software CD-ROM, click the **Solution Software v8.6B for Windows NT/2000** link.
 - a. Click the **KGPSA Driver Update** link to install the HBA driver.
 - b. Click the **Fibre Channel Software Setup** link, then choose one of the Fibre Channel setups, based on your configuration.
 - c. Click the **SWCC** link (optional) to install SWCC components.

NOTE: The latest Large LUN utility must be installed if the storage system will be used prior to upgrading ACS to Version 8.6, and a Large LUN configuration was previously employed.
5. Restart the server.

Updating an Existing Cluster

Be sure you are logged in to the server with no disk resources using an account with administrator privileges.

1. Using **Cluster Administrator**, make note of your original configuration, then move disk resources to the other cluster node. The node being updated should not have any disk resources online. Using Cluster Manager, set all Cluster Groups to **Prevent Failback** while the upgrade is taking place.

IMPORTANT: Cluster Service must continue to run on all nodes. Stopping the Cluster Service during this procedure could result in a Cluster Service failure, and subsequent reinstallation.

2. Stop Steam Agent (SWCC) in **Services**.
3. Using the **Add/Remove Program** in Control Panel, uninstall:
 - a. StorageWorks Command Console (SWCC).
 - b. Large LUN Utility (if installed)

IMPORTANT: Do not Restart the system at this time.

4. Using your Solution Software CD-ROM, click the **Solution Software v8.6B for Windows NT/2000** link.
 - a. Click the **KGPSA Driver Update** link to install the HBA driver.
 - b. Click the **Fibre Channel Software Setup** link, then choose one of the Fibre Channel setups, based on your configuration.
 - c. Click the **SWCC** link (optional) to install SWCC components.

NOTE: The latest Large LUN utility must be installed if the storage system will be used prior to upgrading ACS to Version 8.6, and a Large LUN configuration was previously employed.
5. Restart the updated cluster node.
6. Repeat *Step 1* through *Step 5* for the next cluster node.
7. Once all cluster nodes have been upgraded, using **Cluster Administrator**, restore all Cluster Groups to their original **Prevent Failback** setting, and restore storage groups to their original configuration.

ACS Feature Support

Drive Support

The following drive support enhancements were added in the ACS Version 8.6 release:

- 72 GB drives in 10-slot 1.6 inch shelves and 14-slot 1.0 inch shelves
- Full 14-slot drive support per channel (MA/EMA Series arrays only)
- Maximum storageset size of 1.024 TB
- Maximum of 84 drives behind controllers

Increased Host Connections

The maximum number of host connections has been increased from 64 to 96 for the table of known connections. A connection is unique to the node Worldwide Name (WWN), port WWN, and controller port. This table is maintained in the non-volatile memory (NVRAM) of the controller. If the table contains 96 entries, new connections cannot be added unless unused entries are deleted. Otherwise, a host attempting FC login will be rejected from becoming a connection into the connection table, but not necessarily from the fabric.

Rolling Upgrades

Before initiating an ACS rolling upgrade, please refer to the "Solution Software Upgrade Procedures" Section, page 23, for alternate instructions. These procedures take precedence over controller-based rolling upgrade procedures, and are required when Solution Software is part of the upgrade path.

The *HSG80 Array Controller ACS Version 8.6 Maintenance and Service Guide* describes two upgrade methods; a rolling upgrade procedure and a shutdown upgrade procedure.

At this time, for Windows NT and Windows 2000, the shutdown method is required to perform an ACS upgrade from ACS Version 8.5 to Version 8.6 for a multiple-bus failover configuration in a standalone or clustered environment that contains one or more LUNs configured as any of the following: stripeset (RAID 0), mirrorset (RAID 1), striped mirrorset (RAID 0+1) or RAIDset (RAID 3/5). This method takes the storage devices offline for a period of time while the software is upgraded simultaneously on both controllers without causing "delayed write" errors.

The rolling upgrade can be performed if all LUNs are created from a JBOD device. With only JBOD LUNs configured, the problem does NOT occur in either multiple-bus or transparent failover modes, regardless of whether there is I/O to the LUNs. This is the ONLY configuration for which the Rolling Upgrade can be successfully accomplished when the controllers are configured for multiple-bus failover.

The ACS upgrade path has been reworked to provide more friendly and seamless operation. However, the documented process must be followed carefully to ensure a smooth transition. For more information on upgrade and downgrade procedures, refer to the *HSG80 Array Controller ACS Version 8.6 Maintenance and Service Guide*.

IMPORTANT: Due to the increased host connectivity delivered with ACS Version 8.6F, you must observe new cache size requirements. When upgrading from ACS Version 8.5 to ACS Version 8.6, cache module configurations must be upgraded from the prior minimum of 64 MB (ACS 8.5) to 128 MB in unmirrored configurations, and 256 MB in mirrored configurations, per cache module.

NOTE: The cache size requirements for running ACS Version 8.6P or Version 8.6S have not changed, and remain at 512 MB.

CLI Commands

The following CLI commands have been added or enhanced in ACS Version 8.6:

```
ADD UNIT
SET UNIT
ADD PASSTHROUGH
SHOW PASSTHROUGH
DELETE PASSTHROUGH
EXIT
SET connection-name RESERVATION STYLE
SHOW ID
```

See the *HSG80 Array Controller ACS Version 8.6 CLI Reference Guide* for additional syntax details.

ACS Improvements

The following is a list of corrections included in ACS Version 8.6.

Corrections included in all variations of ACS Version 8.6:

- Excessive polling by using “show unit status” requests (with either the CLI or SWCC) caused the controller to periodically become unavailable.
- Excessive polling of the controller by SWCC to obtain full status information sometimes resulted in controller unavailability with an “unable to allocate large sense buckets” message.
- Correction of forced errors encountered on RAID 3/5 storage units.
- Correction of controller unavailability due to deadman timer and (LED CODE 39).
- Correction of error code in conjunction with cache hardware failure.
- Improved performance in non-mirrored 8 KB mode.
- Correction of Unit attentions being logged inappropriately to the CCL, which sometimes caused controller unavailability.

Corrections included in ACS Version 8.6S and 8.6P only:

- Improved CLI operation while utilizing SNAPSHOT units under high I/O.
- Correction of issue regarding write commands to SNAPSHOT units that caused occasional controller unavailability (i960 fault).
- Correction of rare Secure Path issue with associated units behavior on the controller.

Disk Partitioning

ACS allows partitioning of disk drives or storagesets for improved device management. A partition appears to the operating system as a single virtual disk. Up to eight partitions may be created per storageset or disk drive. Disk partitioning is supported under all failover modes supported by your operating system.

SNAPSHOT

ACS with SNAPSHOT capability provides a quick and efficient way to make a point-in-time copy of a storage container’s data. SNAPSHOT freezes a map of the container’s data which can be separated and used for back-up or testing and manipulation without impacting the original data. After the SNAPSHOT, the original data can continue to be updated and utilized while the SNAPSHOT copy remains unchanged.

When the need for the duplicate copy of data has ended, a new snap of a different storage container can be made and the process repeated. SNAPSHOT eliminates much of the overhead associated with mirroring and cloning as the SNAPSHOT is dissolved without having to re-merge the data.

SNAPSHOT is enabled the instant the following CLI command is entered:

```
HSG80> ADD SNAPSHOT_UNITS
```

See the *HSG80 Array Controller ACS Version 8.6 CLI Reference Guide* for additional syntax details.

The SNAPSHOT unit can be presented to the host. The SNAPSHOT unit remains until it is deleted.

NOTE: SNAPSHOT functionality requires either ACS Version 8.6P or ACS Version 8.6S.

IMPORTANT: ACS SNAPSHOT capability requires 512 MB of cache memory.

Write History Logging

Write history logging, available to users of ACS Version 8.6P, uses a log unit to log a history of write commands and data from the host on the initiator side:

- When the target is inaccessible or
- To synchronize the initiator site data during a planned failover

Mini-merge — If the target becomes inaccessible, the writes that would have gone to the target are logged to the association set's assigned log unit. An inaccessible target in this context refers to both links or target controllers shutting down. When the target becomes accessible, a full copy is not necessary. Only those host writes while the links were down are reissued. This is referred to as a *mini-merge*. If a full copy was in progress at the time of the disconnect, write history logging is not initiated and the full copy is restarted when the target is accessible again.

Fast-Failback — During a planned failover, if write history logging has been enabled at the target site, then when the failback is performed, the initiator site is synchronized through a process called *fast-failback*. The writes that would have gone to the initiator are logged to the association set's log unit. Only those writes since the failover are reissued. A full copy is not necessary.

Dynamic Volume Expansion

Dynamic Volume Expansion creates a specialized volume called a concatset (short for concatenation set) from a storageset that has been given a unit number. Another storageset can then be added to the concatset by using the `SET CONCATSET` command. See the *HSG80 Array Controller ACS Version 8.6 CLI Reference Guide* for syntax details.

Configuration Rules

The following list defines maximum configuration rules for the controller:

- 128 visible LUNs/200 assignable unit numbers
 - In SCSI-2 mode, the CCL is disabled, resulting in 128 visible LUNs.
 - In SCSI-3 mode, the CCL is enabled, resulting in 127 visible LUNs and one CCL.
- 1.024 TB storageset size
- 96 host connections
- 84 physical devices
- 20 RAID 3/5 storagesets
- 30 RAID 3/5 and RAID 1 storagesets
 - NOTE:** This is a combined maximum, limited to no more than 20 RAID 3/5 storagesets.
- 45 RAID 3/5, RAID 1, and RAID 0 storagesets
 - NOTE:** This is a combined maximum, limited to no more than 20 RAID 3/5 storagesets.
- 8 partitions of a storageset or individual disk
- 6 physical devices per RAID 1 storageset (mirrorset)
- 14 physical devices per RAID 3/5 storageset (RAIDset)
- 24 physical devices per RAID 0 storageset (stripeset)
- 45 physical devices per RAID 0+1 storageset (striped mirrorset)

Operating Constraints

This section describes the operating constraints for ACS Version 8.6. An operating constraint is a limitation placed on the operation of the controller. Other constraints on host adapters or other system components may also apply. Keep these constraints in mind to avoid problems and to help achieve the maximum performance from your controller. See the documentation that came with your host server for more details.

External Cache Battery

Compaq recommends that you replace the External Cache Battery (ECB) every two years to prevent battery failure.

If you are shutting down your controller for longer than one day, complete the additional steps in “Shutting Down the Subsystem” in the *HSG80 Array Controller ACS Version 8.6 Maintenance and Service Guide*. This will prevent the ECB from discharging during planned power outages.

Dual External Cache Battery Failures

The array controller cache policy provides for proper handling of a single ECB failure as described in the *HSG80 Array Controller ACS Version 8.6 Troubleshooting Reference Guide*. For dual ECB failures, it states that no failover occurs. For this release, if a dual ECB failure is detected both controllers will be restarted.

Boot Support

Booting from the Enterprise/Modular Storage RAID Array is supported for Windows NT or Windows 2000 using the DS-KGPSA-CB adapter only. Look for application notes or web pages in the support section of the Compaq website.

<http://www.compaq.com/storage/index.html>

File System Limitations

Table 9 describes known limitations that certain file systems have regarding storage unit size.

Table 9 File System Storage Unit Limitation

Disk Size	Storageset Configuration	Operating and File System
4 GB	Any	Windows NT4.0 /Windows 2000 FAT File System
16 TB	Any	Windows NT 4.0/Windows 2000 NTFS File System

PVA Switch Setting

After installing the EMU in each cabinet, ensure that the SCSI ID number on the PVA is set according to Table 10 (BA370 Enclosures only).

Table 10 SCSI ID Number on the PVA

Cabinet	PVA SCSI ID Setting
Master enclosure	0
First expansion enclosure	2
Second expansion enclosure	3

Using FRUTIL to Insert a New Controller

When using FRUTIL to insert a new controller in a dual-redundant controller configuration, you will see a new set of instructions after the new controller has been inserted:

If the other controller did not restart, follow these steps:

1. Press and hold the **Reset** button on the other controller.
2. Remove and re-insert the program card for the other controller.
3. Release the **Reset** button.

NOTE: Whenever you are running FRUTIL you must quiesce all I/O.

FRUTIL Limitation

This limitation applies to users of ACS Version 8.6P with DRM only.

NOTE: FRUTIL cannot be run in remote copy set environments on the target side specifically when I/O is in progress.

If the host load has been stopped, you can run FRUTIL on the initiator or target. If the host load is not quiesced and FRUTIL is run while remote copy I/Os are running, the normalization process will reset.

Saving Your Configuration

When enabled, the `SAVE_CONFIGURATION` function allows you to do the following (supported on single controller configurations only):

- Save a configuration to a disk or storage set. The configuration may be retrieved later and downloaded onto a replacement controller.
- Retain code patches to the ACS software.

Saving a Configuration to Previously Initialized Storage Sets

If any storage set within the configuration was previously initialized with the `INITIALIZE` container-name `SAVE_CONFIGURATION` command to save your configuration to disk, it will not be necessary to reconfigure your devices with a new controller.

`SAVE_CONFIGURATION` also retains code patch information to the software. This option is supported on single controller configurations only.

ACS Version 8.6 saves any installed software patches on disks initialized with the `SAVE_CONFIGURATION` option. To replace a controller and restore the configuration from a disk, you will not have to reinstall any software patches.

Configuration information cannot be retrieved from storage sets created on other HSx controllers (for example, HSD, HSJ, or HSZ controllers). You can only restore a configuration from a configuration saved on this or another HSG80 array controller.

Avoiding Problem Situations

Under certain conditions, you may experience unusual array controller behavior. This section presents information to help you avoid such situations and to recover from them if they occur.

ACS Patch Memory

Any installed ACS Version 8.5 (or lower) patches should be removed after an ACS Version 8.6 installation since they are no longer applicable. This will free up HSG80 patch memory for future ACS patches.

To check or remove ACS patches, run the “Code Load and Code Patch” Utility by typing the following command:

```
HSG80> RUN CLCP
```

Adding, Moving, and Changing Devices

The array controller maintains a configuration map of a device’s type and location. This map is used to communicate with devices. If you add, move, or change a device while the array controller is powered off, without first changing the array controller configuration, the array controller is not able to communicate with the changed device when it returns to service.

If a device is removed by mistake while the array controller is off, delete all containers associated with the removed device after power has been restored to the array controller.

If a device is replaced while the array controller is off, install the replacement device before restoring power to the array controller. Once power is restored, use the `DELETE DISK CLI` command to remove the disk from the configuration. Then use the `ADD DISK CLI` command to add the new device. This will correctly remove the failed device and add the new device after restoring power to the array controller.

See the *HSG80 Array Controller ACS Version 8.6 CLI Reference Guide* for details on CLI command usage and syntax.

See the *HSG80 Array Controller ACS Version 8.6 Maintenance and Service Guide* for correct device removal and addition procedures.

Moving Storage Sets

Move only normal storage sets.

IMPORTANT: Do not move storage sets that are reconstructing or have been reduced, or data corruption will result.

Adding, Moving, and Changing Array Controllers, Cache Modules, or External Cache Battery Storage Building Blocks

You can replace the array controller, cache module, or External Cache Battery (ECB) Storage Building Block (SBB) while the storage system is shut down. However, you must enter the `SHUTDOWN THIS_CONTROLLER` command prior to shutting down the storage system in order to make configuration changes. If two array controllers are configured in a dual-redundant configuration, you must first enter the `SHUTDOWN OTHER_CONTROLLER` command.

These commands instruct the array controllers to flush all unwritten data from the cache modules and discontinue all I/O activity. For more information regarding the `SHUTDOWN` controller command, see the *HSG80 Array Controller ACS Version 8.6 CLI Reference Guide*. For information on maintenance and replacement of the array controller, cache module, and external cache battery, see the *HSG80 Array Controller ACS Version 8.6 Maintenance and Service Guide*.

SWCC SCSI Connection

The SWCC Client SCSI connection can sometimes produce the following error popup when trying to connect through the CCL:

```
Error scanning subsystem. Command Execution Error:  
[DeviceIOControl Error:]
```

Additionally, physical devices may not appear in the Select Device dropdown list. The SWCC CLI Window will terminate if the New Window icon is selected, or if New is selected from the File Menu, followed by clicking the **Cancel** button on the Connection Selection dialog box.

Therefore, we strongly suggest that you use the Agent in managing the storage system.

Host Operating System Notes

The following section identifies host specific operating notes.

Host Operating System Support of Multiple-Bus Failover

Multiple-bus failover is supported on the Windows NT and Windows 2000 operating system through the use of SANworks Secure Path software. See "Secure Path Software" Section, page 22, for version compatibility and restrictions.

Upgrading DS-KGPSA-BC Firmware

This procedure is used when upgrading the DS-KGPSA-BC HBA firmware from Version 2.x to Version 3.x (for example, v2.20x7 to v3.20x7).

Version 3.x firmware is Fibre Channel Standard compliant and uses a different World Wide Name (WWN) for Host and Port (2xxx-xxxx-xxxx-xxxx format for Host and 1xxx-xxxx-xxxx-xxxx for Port, where xxx-xxxx-xxxx-xxxx is identical in both).

The new WWN structure creates new Host Connections on the HSG80 controllers for the HBA. The original host connections will be marked offline, and no longer be usable.

To maintain server access to storage units behind the HSG80 controllers, the storage units must have their access changed to use the new Host Connections.

Use the following procedure to upgrade your DS-KGPSA-BC HBA firmware from Version 2.x to Version 3.x:

1. Connect a PC or terminal to the maintenance port of Controller A and get a listing of the host connections by typing the command:

```
HSGA> SHOW CONNECTIONS
```

The resulting display should appear similar to the following:

```
Connection Unit
Name Operating system Controller Port Address Status Offset
!NEWCON68 WINNT OTHER 2 021900 OL other 0
HOST_ID=2000-0000-C920-A562 ADAPTER_ID=1000-0000-C920-A562
!NEWCON69 WINNT THIS 1 021900 OL this 0
HOST_ID=2000-0000-C920-A562 ADAPTER_ID=1000-0000-C920-A562
!NEWCON70 WINNT THIS 1 011800 OL this 0
HOST_ID=2000-0000-C921-4D3D ADAPTER_ID=1000-0000-C921-4D3D
!NEWCON71 WINNT OTHER 2 011800 OL other 0
HOST_ID=2000-0000-C921-4D3D ADAPTER_ID=1000-0000-C921-4D3D
W2K01A-A1 WINNT THIS 1 011800 offline 20
HOST_ID=1000-0000-C921-4D3D ADAPTER_ID=1000-0000-C921-4D3D
W2K01A-B2 WINNT OTHER 2 011800 offline 20
HOST_ID=1000-0000-C921-4D3D ADAPTER_ID=1000-0000-C921-4D3D
W2K01B-A2 WINNT THIS 1 offline 20
HOST_ID=1000-0000-C920-A562 ADAPTER_ID=1000-0000-C920-A562
W2K01B-B1 WINNT OTHER 2 offline 20
HOST_ID=1000-0000-C920-A562 ADAPTER_ID=1000-0000-C920-A562
W2K02A-A1 WINNT THIS 1 021800 OL this 40
HOST_ID=1000-0000-C921-4F5E ADAPTER_ID=1000-0000-C921-4F5E
```

2. Note the WWNs of the **ADAPTER_ID** of the new connections.
3. Find the offline connections with the same **ADAPTER_ID** WWNs and note the unit offsets.
4. Get a listing of all storage units and the host connections that have access enabled to them typing the following command:

```
HSGA> SHOW UNIT FULL
```

5. For all of the units that have enabled access for the offline connections, type:

```
HSGA> SET <unit name> DISABLE_ACCESS=<offline host connection name #1>
```

```
HSGA> SET <unit name> DISABLE_ACCESS=<offline host connection name #2>
```

```
...
```

6. Delete the offline host connections by typing:

```
HSGA> DELETE <offline host connection name #1>
HSGA> DELETE <offline host connection name #2>
...
```

7. Rename the new connections to the name of the previously matching offline host connection name by typing:

```
HSGA> RENAME !NEWCONnn <offline host connection name #1>
HSGA> RENAME !NEWCONnn <offline host connection name #2>
...
```

8. Enable access for these new host connections to the storage units by typing:

```
HSGA> SET <unit name> ENABLE_ACCESS=<offline host connection
name #1>
HSGA> SET <unit name> ENABLE_ACCESS=<offline host connection
name #2>
...
```

Windows NT and Windows 2000

- Both Windows NT and Windows 2000 can run Microsoft's Cluster Service Software. Refer to documents that come with Microsoft's software kits for instructions in setting up Microsoft Clusters.
- There is no Hot Plug support for KGPSA adapters under Windows NT 4.0 or Windows 2000 at this time. Check the Compaq Support web page for updates.
- Windows NT and Windows 2000 support SCSI-2 and SCSI-3 modes. Refer to the *HSG80 ACS Solution Software Version 8.6 Installation and Configuration Guide* that comes with this kit for more information.
- Compaq recommends that you load software directly from the Solution Software CD-ROM when installing drivers and running the Fibre Channel Setup Utility. You may experience problems on some systems if you first copy the CD-ROM contents to a disk drive and install from there.
- Windows 2000 dynamic volumes are supported in a transparent failover configuration only.
- Cloning a Windows 2000 dynamic disk is allowed but the CLONE or original can be mounted, but not both to the same host.

Windows NT Specific Notes

- Fibre Channel software setup handles HszDisk and HS_service installation. This is sometimes referred to as HSZinstall in the documentation.

IMPORTANT: Do not use the Large LUN model with Windows NT Service Pack 5 under any circumstances. Windows NT Service Pack 6A is the stated minimum for this Solution Software.

- In a situation where you are replacing a server with another and using the existing drives (storage sets) behind the array controllers, you may find drive to drive letter mapping changes. During such a system changeover, please remap drives to drive letters using the Disk Administrator to restore proper access to your data.
- To delete the 8 MB EISA-type partition on new disk drives, as discussed in the "Disk Device Support" Section, page 16, create a unit and delete the partition in Disk Administrator.

Windows 2000 Specific Notes

- New Universal Disk Drives (or units that are migrated from SmartArray controllers usage) being configured into storageset members need to be initially written to with DILX (a diagnostic utility on the HSG storage systems). DILX only operates on units. Therefore, the new disks must be configured into a unit prior to running DILX. Optionally, the HSUTIL format disk utility may be used on a disk device.
- The Fibre Channel Setup Utility installs HS_service and HsxDisk software components. These are similar to HS_service and HszDisk in the Windows NT setup procedure.
- In some Fibre Channel switch configurations, disk devices that are discovered as part of the Windows 2000 Plug-and-Play process display an erroneous message in the Device Manager screen. However, data to and from the drives is unaffected and work correctly. During subsequent system reboots, these erroneous messages disappear as the disk to driver status is correctly synchronized. It's normal to see event log messages from HS_service during certain routine procedures. These are a result of SCSI bus resets that occur during controller events like startups and controller failovers. Some messages appear as warnings and some as errors. With Compaq ProLiant servers, as long as the message source is HS_service, you should let the Proactive Services software handle the interpretation.
- There are two situations where you may experience drive letter remapping. This could affect access to data by programs you may need to run. The first situation is one where you replace one server with another. The second is a situation in which you simply

replace a KGPSA adapter in one of your systems. During such a system or adapter changeover, be sure to manually remap drives to drive letters using the Disk Management. This will restore proper access to your data.

- If you replace a KGPSA adapter in a server, you will need to reinstall the KGPSA driver and then rerun the Fibre Channel Setup Utility. The reason for this is that Windows 2000 may automatically reload the original driver for this adapter and reset many of the important registry settings. New connections are created on the HSG controller. Those connections should be renamed and assigned to the appropriate units.

For more information about installing the adapter, refer to the *HSG80 ACS Solution Software Version 8.6 Installation and Configuration Guide* and use the software on the Solution Software CD-ROM.

Upgrading from Windows NT 4.0 to Windows 2000

If you are upgrading from Windows NT 4.0 to Windows 2000, you must remove the software components installed by the previous version of the Fibre Channel Setup Utility. The steps are as follows:

1. Remove the software components installed from the previous Fibre Channel Setup Utility. To do this, locate the previous CD-ROM and run the utility. Follow the procedures in it to remove components. Alternately, you can use the **Add/Remove Programs** applet.
2. Upgrade from Windows NT 4.0 to Windows 2000 as instructed by Microsoft's documentation.
3. Reboot.
4. Install the KGPSA driver upgrade as instructed in the *HSG80 ACS Solution Software Version 8.6 Installation and Configuration Guide*.
5. Run the Fibre Channel Setup Utility to complete your installation.

Large LUNs for Windows NT and Windows 2000

Enabling Large LUNs provides the ability for a Windows NT or Windows 2000 server to have access to LUNs beyond the 0-7 range, and to access more than 8 LUNs per target. The host can access unit D10 by leaving the connection offset at 0. The maximum amount of LUNs supported is 64 per storage system. The LUNs can be contiguous or non-contiguous.

NOTE: Large LUNs are supported on Windows NT, Windows 2000 Server, Advanced Server and Datacenter. Windows 2000 Datacenter is addressed through separate documentation within this Solution Software Kit.

Large LUN Utility for Windows

The Large LUN utility is available on your Solution Software CD-ROM. It is also available for download at:

<http://www.compaq.com/storage/index.html>

NOTE: The Large LUN utility is provided, but unnecessary if ACS Version 8.6 is running alone, or in conjunction with Secure Path Version 3.1A Service Pack 1, which has built-in support.

Support for EBS and Secure Path Software is included as part of the Large LUN Utility for Windows. The utility automatically installs all necessary registry keys and parameters.

Large LUNs are supported on ACS Version 8.5 and higher running on an array controller. Large LUNs can be used in conjunction with Secure Path, DRM, EVM and EBS solutions. For limitations specific to these applications, please see the product documentation.

Windows 2000

Enabling Large LUNs on Windows 2000 requires creating several device specific registry keys located in:

\\HKEY_LOCAL_MACHINE\System\CurrentControlSet\Control\ScsiPort\SpecialTargetList

The format of these keys is:

- VendorID=8 characters
- ProductID=16 characters
- Revision=1 character truncated

Spaces are replaced by the underscore character. For example, the key would look like this:

DEC_____HSG80_____V

These keys have to match exactly. The string values for these keys are:

LargeLuns	REG_DWORD	1
DisconnectedLuns	REG_DWORD	1

NOTE: For Windows 2000, a file named `HsgCCL.inf` will be installed to automate the installation of the HSGx0 device, if you chose to configure the storage system in SCSI-3 mode.

Windows NT

To enable Large LUNs on Windows NT requires only one registry parameter change. It is located in:

`\\KEY_LOCAL_MACHINE\System\CurrentControlSet\Services\LP6NDS35`

The string value for this key is:

LargeLuns	REG_DWORD 1
-----------	-------------

Secure Path

To enable Large LUNs on a host running Compaq SANworks Secure Path software, the registry has one parameter located in:

`\\KEY_LOCAL_MACHINE\System\CurrentControlSet\Services\Raidisk\Parameters`

The string value for this is:

MaximumLuns	REG_DWORD 64 (Decimal)
-------------	------------------------

If a host has access to 64 LUNs, the LUN numbers must be between 0-63. See the latest Secure Path documentation for supported versions.

EBS

For Windows 2000, `cpqmdr.inf` is installed to the `\\%systemroot%\inf` folder to automate the installation of the Modular Data Router device.

DRM, EVM, Microsoft Clusters

Large LUN is fully supported with these products. See the documentation for each concerning restrictions or limitations.

Controller Configuration

Compaq recommends to set the `SCSI_VERSION` to SCSI-3 for maximum availability.

- Multiple-bus failover mode

Support for 64 LUNs per storage system (SCSI-2 mode) or 63 LUNs + 1 CCL (SCSI-3). These LUN numbers must be numbered between 0-63.

■ **Transparent failover mode**

Support for 64 LUNs per storage system (SCSI-2 mode) or 63 LUNs + 1 CCL (SCSI-3). These LUN numbers can range between 0-199.

The chart below indicates which cases Large LUNs are enabled.

	ACS Version 8.5		ACS Version 8.6	
	WNT	W2000	WNT	W2000
SCSI-2 LUN 0 present	Y	Y	Y	Y
SCSI-2 LUN 0 not present	N	N	N	Y
SCSI-3 LUN 0 always present	Y	Y	Y	Y

Y = functional

N = not functional

Known Limitations

In Windows 2000, if any LUN greater than 7 is removed and a subsequent disk rescan is performed, the “Found New Hardware” wizard may ask you to finish the installation of the device that was removed. The Device Manager may show the device with a yellow warning icon on it. A reboot of the system will completely remove the device.

Utility Uninstall Procedure

1. Choose **Start > Settings > Control Panel** and open **Add/Remove Programs**.
2. Select Large LUN Utility.
3. Click **Add/Remove** (Windows NT) or Click **Change/Remove** (Windows 2000).
4. Choose Remove from Maintenance screen.

The utility is removed.

Documentation Anomalies

The following are known additions and corrections to the *HSG80 ACS Solution Software Version 8.6 Installation and Configuration Guide*.

- The “Configuration Rules” on page 2-3, under “Planning Storage,” are incomplete. See the "Configuration Rules" Section, page 35, of these Release Notes for a full and updated rule set.
- Under “Installing the Client,” on page B-2 of Appendix B, the following restriction should be observed when installing SWCC on Windows NT 4.0 Workstations:

If you select all of the applets during installation, the installation will fail on the HSG60 applet and again on one of the HSG80 applets. The workaround is to install all of the applets you want except for the HSG60 applet and the HSG80 ACS 8.5 applet. You can then return to the setup program and install the one that you need.

In a SAN environment where you would need both HSG60 and HSG80 storage systems, Compaq recommends you install both, but one at a time. This problem is not seen under Windows NT 4.0 Server.
- Under “Installing the Client,” in step 3 on page B-3 of Appendix B, select the “HSG80 Controller for ACS85 newer” menu option to properly install SWCC client.

